

Studies on Effect of Planting Dates and Varieties on Growth and Quality in Gladiolus (*Gladiolus hybridus* Hort.) Under Sub-Humid Zone of Rajasthan

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Abstract A field experiment was conducted during winter season of 2015-16 to study “Studies Effect of Planting Dates and Varieties on Growth and Quality on Gladiolus (*Gladiolus hybridus* Hort.) under sub-humid zone of Rajasthan” having 15 treatment combinations of five Varieties (V₁- African Star, V₂- Hunting Song, V₃- Legend, V₄- Pusa Srijana and V₅- Snow Princess) and three planting dates (D₁- 10th October, D₂- 25th October and D₃- 9th November). The treatment V₂D₁ (Hunting Song + 10th October planting) recorded the maximum plant height (116.10 cm), highest number of leaves per plant (8.77), main stem diameter (1.50 cm), number of florets per spike (15.8), spike length (91.80 cm), rachis length (57.90 cm), floret diameter (10.04 cm), vase life of spike (13 days), While the maximum leaf length (64.20 cm), leaf width (4.96 cm) in (V₅D₃) and maximum spike girth (0.91cm) was found in (V₁D₂). The growth and flowering quality was found superior in compare to other planting dates.

Keywords Varieties, Planting Dates, Gladiolus, Spike

1. Introduction

Gladiolus (*Gladiolus hybridus* Hort.) is an important cut flower crop, grown commercially in many parts of the world. It has gained popularity owing to its incomparable beauty, attractive colours, various sizes and shapes of florets, variable spike length and long vase life. Gladiolus produces beautiful spikes from December to March in the plains and from June to September in the hills of India. The genus *Gladiolus* belongs to family Iridaceae. Gladiolus is very rich in its varietal wealth and every year there is an addition of new varieties; hence varietal evaluation becomes necessary to find out suitable variety for a particular region. Improvement of any crop is a continuous

process and in gladiolus also there is scope to improve the existing cultivars. In gladiolus the most common method of improvement is through hybridization. Since the gladiolus is highly heterozygous, it becomes more essential to evaluate. Like all other economical plants, the growth and development of gladiolus is governed by its genetic makeup and environmental factors of the growing region and various management practices. Among the various agro-techniques, the optimum planting time is of outmost importance. Present research efforts aim at standardization of planting date and suitability of varieties for local climate and edaphic conditions of the sub-humid zone of Rajasthan.

Date of planting plays an important role in regulating growth and quality of gladiolus. Vegetative growth and quality of gladiolus is improved by proper planting times which also satisfy the consumer's demands [1]. Different planting schedule supply gladiolus steadily to the market as well as it adds to the beauty of the landscape longer. The timing of flowering from various planting dates is quite predictable under ideal environmental conditions. The growth and yield of gladiolus like other plants depend upon planting time e.g., number of florets/spike, spike length, floret diameter, floret length was best with October planting [2].

2. Materials and Methods

A field experiment was conducted during winter season of 2015-16 at College of Horticulture & Forestry, Jhalawar. Corms of gladiolus cultivars were collected from College of Horticulture and forestry jhalawar (Rajasthan). Healthy and uniform size corms of 4-5 cm diameter were planted at different planting dates. The experiment consisted of 15 treatment combinations (V₁D₁, V₁D₂, V₁D₃, V₂D₁, V₂D₂, V₂D₃, V₃D₁, V₃D₂, V₃D₃, V₄D₁, V₄D₂, V₄D₃, V₅D₁, V₅D₂, V₅D₃) comprising of five

varieties (V_1 - African Star, V_2 - Hunting Song, V_3 - Legend, V_4 - Pusa Srijana and V_5 - Snow Princess) and Three planting date (D_1 - 10th October, D_2 - 25th October and D_3 - 9th November) laid out in split plot design with three replications. The observations plant height was recorded in centimeters from ground to tip of the spike, Leaf length, leaf width, spike length, rachis length, spike girth and floret diameter recorded in centimeter, number of leaves produced was counted after emergence of spike, number of floret per spike counted after full blooming of all spike florets and vase life of spike counted in days. Length of 4th leaf from base to tip of the leaf and stem diameter was measured with the help of digital vernier calipers. The number of spikes produced per mother corm, number of spikes produced per plot was counted.

Statistical analysis: The experimental data are to be recorded during the course of investigation for various characters under study with appropriate statistical analysis [3] along with suitable interpretation. The data analysis by split plot design and in this experiment use two factors one factor is varieties and another factor was planting dates. The date of planting was known as main factor and varieties were known as sub factor. The main factor (Planting dates) applied in sub plot and sub factor (varieties) applied in main plot.

3. Result

The growth and flowering quality characters differed significantly for the varieties, planting dates and interaction of varieties x planting dates (Table 1&2). The maximum plant height (112.81 cm), highest number of leaves per plant (8.51), main stem diameter (1.47 cm), number of florets per spike (14.97), spike length (85.13 cm), rachis length (54.77 cm), floret diameter (9.99 cm), vase life of spike (13 days), While the maximum leaf length (61.97 cm), leaf width (4.57 cm) in (V_5) and maximum spike girth (0.84cm) was found in (V_1). The growth and flowering quality was found superior in 'Hunting Song' compare to other varieties.

The maximum plant height (106.97 cm), highest number of leaves per plant (8.04), main stem diameter (1.38 cm), minimum days to spike emergence (63.57days), number of florets per spike (14.12), spike length (80.88 cm), rachis length (46.62 cm), floret diameter (9.44 cm), , While the maximum leaf length (57.24 cm), leaf width (3.40 cm) in (D_3), maximum spike girth (0.81cm) and vase life of spike (9.93 days) was found in (D_3). The growth and flowering quality was found superior in 10th October planting dates as compare to other planting dates.

The interaction of varieties & planting dates had the maximum plant height (116.10 cm), highest number of leaves per plant (8.77), main stem diameter (1.50 cm), number of florets per spike (15.8), spike length (91.80 cm),

rachis length (57.90 cm), floret diameter (10.04 cm), vase life of spike (13 days), While the maximum leaf length (64.20 cm), leaf width (4.96 cm) in (V_5D_3) and maximum spike girth (0.91cm) was found in (V_1D_2). The growth and flowering was found superior in 'Hunting Song'+ 10th October planting dates (V_2D_1) compare to other planting dates and varieties.

4. Discussion

The variation in plant height of different date of planting may be due to development of better root system and luxuriant growth which resulted large quantity of photosynthesites under such favorable condition. Similar finding amongst gladiolus varieties have also been reported by Sheikh and [4, 5] in gladiolus. Plant height depends upon the genetic constitution. The variation in plant height among the various varieties might be due to genotypic differences in phenotypic expression of plant height [6]. Similar finding amongst gladiolus varieties have also been reported by [7, 8] in gladiolus.

Higher number of leaves in early planting could be attributed to optimum time of planting and nutrient for growth of plants [9] in Tuberose. Similar findings have also been reported by [10, 11] in gladiolus. Further the variation in number of leaves per plant among the varieties might be due to the genotype influence on phenotypic expression of general vigor of plants as evident from the results on plant height, number and size of leaves and corms. The maximum number of leaves per plant in October was the result of the finding that at the time the plants might had acquired maximum efficiency for development due to ideal condition. [12] also found that earlier planting produced the well-developed plants of gladiolus. Variation in number of leaves per plant in different genotypes has also been reported in gladiolus by [13].

The variation in leaf length of the varieties might be due to their genetic make-up [14]. Similar findings on variation in leaf size of different varieties have been reported by [15, 16, 17] in gladiolus. The favorable effect of 9th November planting on leaf length might be due to less number of leaves of the plant due to higher photosynthetic activity and ultimately enhanced plant growth and the leaf length. Similar results have been reported by [18] in gladiolus.

The variation in leaf width might be due to variability in genetic constitution of the varieties stimulating leaf width might be due to triggering higher photosynthetic activities which might have favored cell division and cell enlargement which ultimately enhanced the size of leaves as reported by [19]. The present results also find support [18] in gladiolus.

Table 1. Effect of planting dates and varieties on vegetative growth of gladiolus

Treatment	Plant height (cm)	Number of leaves per plant	Leaf length (cm)	Leaf Width(cm)	Main stem diameter (cm)
Varieties					
V ₁	96.22	7.11	53.93	2.44	1.14
V ₂	112.81	8.51	52.40	2.88	1.47
V ₃	100.99	8.47	57.63	3.27	1.31
V ₄	98.77	7.48	49.50	3.27	1.37
V ₅	105.92	7.44	61.97	4.57	1.20
CD at 5%	5.69	0.40	6.57	0.37	1.10
Planting dates					
D ₁	106.79	8.04	52.34	3.16	1.38
D ₂	104.53	7.82	55.8	3.30	1.28
D ₃	97.51	7.55	57.24	3.40	1.20
CD at 5%	5.98	0.25	3.28	0.38	1.11
Interaction					
V ₁ D ₁	102.66	7.21	48.8	2.33	1.20
V ₁ D ₂	101.44	7.11	58.4	2.42	1.10
V ₁ D ₃	84.55	7.0	54.6	2.56	1.00
V ₂ D ₁	116.10	8.77	48.0	2.80	1.5
V ₂ D ₂	114.66	8.55	56.1	2.80	1.5
V ₂ D ₃	107.66	8.22	53.1	3.04	1.4
V ₃ D ₁	102.66	8.66	57.4	3.13	1.5
V ₃ D ₂	101.99	8.55	59.7	3.31	1.2
V ₃ D ₃	98.33	8.21	55.8	3.37	1.2
V ₄ D ₁	103.77	7.77	49.4	3.39	1.4
V ₄ D ₂	99.77	7.33	47.8	3.36	1.4
V ₄ D ₃	92.77	7.33	51.3	3.05	1.3
V ₅ D ₁	108.77	7.77	58.1	4.14	1.3
V ₅ D ₂	104.77	7.55	63.6	4.60	1.2
V ₅ D ₃	104.22	6.99	64.2	4.96	1.1
CD at 5%	10.36	0.43	5.68	0.66	2.10 (NS)

The production of strong and sturdy stem or thin and weak stem might be due to genetic makeup of varieties which could have been further affected by environmental condition [20]. The results are in line with the findings of [21]. Further, thicker stems in early planting could be attributed to stronger and sturdier growth of plants due to developed better root system and maximum photosynthesis under such favorable condition. Similar responses have also been observed by [12, 10].

The variation in number of florets per spike might be due to their genetic make-up that could have also been influenced by the environmental condition (especially temperature and photoperiod) prevailed during trial period [6]. The number of florets per spike might have been positively correlated with other morphological characters of the varieties viz. number of leaves per plant, rachis length, number of nodes on rachis, etc. Similar results on

floret number have been reported by [7, 13] in gladiolus.

The production of strong and sturdy spikes or thin and weak spikes might be controlled by the genetic makeup of varieties and it could have also been affected by environmental conditions [20]. The reports are in line with the findings of [21]. The overall improved vigor and growth in November planting of plants might have resulted in thicker stems which might be due good climatic condition for plant growth and development. Similar responses for spike girth have also been observed by [22] in gladiolus.

The variation in spike length among the various varieties might be due to genotypic differences in phenotypic expression of spike length. Spike length depends upon the genetic constitution and number of node and internodes length [8]. Another probable reason for variation of spike length among the varieties might be the environmental

conditions prevailed during growth stage of spike and after slipping stage. The similar result has been reported by [6, 13] in gladiolus.

The rachis length might be genetically correlated to number of nodes on the rachis, spike length and plant height that might have also been influenced by the environmental condition of experimentation period. Similar finding also have been reported by [7, 13] in gladiolus.

The floret size due to sum and products of genotypes and more photosynthesis, cell division and enlargement and ultimately more development of the sink (flowers) and ultimately enhanced floret size. The results also find support from findings of [18] in gladiolus. Favourable growing condition with mild temperature, high relative

humidity and low rate of evaporation prevailing during the crop period might have become favourable for bigger size of flowers in October planting have also been reported by [23] in gladiolus.

The variation in vase life amongst the varieties and planting date might be due to different level of reserve carbohydrates in the cut spikes [6]. It could be due to variation among the varieties for production of photosynthates due to variation in photosynthetic area (leaf number and size). The plant from late plantings, the flower initiation and development were confronted with high temperature intensities during late planting. A tremendous heat along with longer day's period might have caused a reduction in growth, quality and vase life of gladiolus drastically.

Table 2. Effect of planting dates and varieties on quality of gladiolus

	No. of floret per spike	Spike girth (cm)	Spike length (cm)	Rachis length (cm)	Floret diameter (cm)	Vase life of spike (days)
Varieties						
V ₁	14.03	0.84	68.23	40.87	8.84	9.56
V ₂	14.97	0.77	85.13	54.77	9.99	13.00
V ₃	11.7	0.69	72.27	39.6	9.61	7.67
V ₄	13.3	0.79	71.23	41.73	8.99	8.22
V ₅	13.37	0.81	75.87	44.83	8.94	10.67
CD at 5%	1.38	0.92	7.01	4.70	0.07	1.19
Planting dates						
D ₁	14.12	0.74	80.28	46.62	9.44	9.79
D ₂	13.52	0.80	75.08	44.88	9.42	9.75
D ₃	12.78	0.81	68.28	41.58	8.95	9.93
CD at 5%	1.74	0.53 (NS)	5.25	5.00	0.06	0.56
Intrection						
V ₁ D ₁	14.9	0.76	73.6	43.8	9.14	9.67
V ₁ D ₂	14.0	0.91	72.3	43.2	9.17	9.33
V ₁ D ₃	13.2	0.84	58.8	35.6	8.22	9.67
V ₂ D ₁	15.8	0.74	91.8	57.9	10.04	13.00
V ₂ D ₂	15.3	0.77	84.7	53.3	10.03	12.7
V ₂ D ₃	13.8	0.79	78.9	53.1	9.91	13.3
V ₃ D ₁	12.0	0.65	75.9	41.2	9.63	7.33
V ₃ D ₂	11.8	0.70	71.4	40.2	9.76	7.67
V ₃ D ₃	11.3	0.71	69.5	37.4	9.44	8.0
V ₄ D ₁	13.9	0.76	76.8	43.9	9.12	8.67
V ₄ D ₂	13.3	0.79	70.9	42.7	9.23	8.33
V ₄ D ₃	12.7	0.82	66.0	38.6	8.61	7.67
V ₅ D ₁	14.0	0.79	83.3	46.3	9.19	10.3
V ₅ D ₂	13.2	0.81	76.1	45.0	8.91	10.7
V ₅ D ₃	12.9	0.84	68.2	43.2	8.59	11.0
CD at 5%	3.03	0.92 (NS)	9.09	8.65	0.11	0.98

5. Conclusions

The experiment on Effect of Planting Dates and Varieties on Growth and Quality on Gladiolus (*Gladiolus hybridus* Hort.) Under Sub-Humid Zone of Rajasthan consisted of 15 treatments consisting of 5 varieties and 3 dates of planting of which with respect to varieties Hunting Song with 10th October planting date recorded the maximum plant height (112.81 cm), highest number of leaves per plant (8.51), maximum main stem diameter (1.47 cm), maximum number of florets per spike (14.97), highest spike length (85.13 cm), maximum rachis length (54.77 cm), maximum floret diameter (9.99 cm), maximum vase life of spikes (13.00 days). The best growth behavior/plant was obtained under early plantation by widening the planting distances. Early planting date and close planting distance positively affected the seeds and oil yield/fed. This study opens a path for further specific studies on suitable agronomical conditions to reach the production quality of this economical plant.

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